



US Army Corps
of Engineers
Detroit District

Great Lakes Update

Great Lakes Navigation

The Great Lakes-St. Lawrence Seaway System is a vital link in shipping and navigation operations throughout the continent and the world. The U.S. Army Corps of Engineers responsibility in the Great Lakes dates back to the 1840s, with the dredging of navigation channels and the construction of lighthouses necessary for safe navigation. Since then, the Detroit District's responsibility has grown to include the maintenance of 36 deep draft and 55 shallow draft harbors, 99 miles of structures and 611 miles of shipping channels throughout the lakes.

In 1881, the Detroit District took over operation and maintenance of the world famous Soo Locks at Sault Ste. Marie, Michigan (Figure 1). The locks are essential to navigation interests because they allow vessels to safely traverse the 21-foot drop in water level between Lake Superior and Lake Huron. Prior to the construction of the locks, ships were required to unload their cargo and traverse the rapids area on land. This process, called portaging, is how Portage Avenue in Sault Ste. Marie, MI was named.

Approximately 8,000 vessels pass through the Soo Locks each year, carrying more tonnage than any other set of locks in the world. In 2005 the total tonnage of all vessels transiting the locks was 81.9 million tons. Close to 550,000 people

visit the Soo Locks annually either on land or via tour boats.

There are 4 navigations locks at the Soo. The largest of four, the Poe, measures 1,200 feet in length and 110 feet wide and can handle the largest vessels navigating the Great Lakes today. A new "Poe sized" lock is proposed to replace the now closed Davis and Sabin locks. The purpose is to provide for more efficient movement of waterborne commerce. The new lock is currently in its predesign phase.



Figure 1: The world famous Soo Locks at
Sault Ste. Marie, MI

Vessels

At any one time there could be hundreds of commercial vessels at sail on the Great Lakes (Figure 2). From the familiar lakes bulk freighter or “lakers” to ocean going “salties” these boats and ships carry a wide variety of cargo ranging from wheat to iron ore. Shipping is increasingly important to the manufacturing industry of the United States, Canada and the world.

The U.S flagged fleet is mostly made up of self-unloading bulk freighters, carrying iron ore, coal and other bulk commodities. According to the Lake Carriers Association (LCA), a Cleveland, Ohio based trade association representing the Great Lakes shipping industry, 53 U.S. flagged lakers were in service on April 11, 2006. Thirteen of these boats are classified as super carriers, meaning they have a length of at least one thousand feet (LCA).



Figure 2: Two “thousand footers” passing Belle Isle in the Detroit River

According to the Great Lakes and Seaway Shipping webpage (boatnerd.com), the largest “laker” on the Great Lakes is the *Paul L. Tregurtha*, a dry bulk self-unloading carrier operated by the Interlake Steamship Company of Richfield, OH. At just shy of 1,014 feet long and 105 feet wide, the boat took over the title of “Queen of the Lakes” when christened in 1981. To give an idea of the immense size of the boat, when the *Tregurtha* is transiting through the Soo

Locks, there is only 2.5 feet of clearance on the port and starboard sides. The vessel’s cargo capacity is close to 68,000 tons and mostly consists of iron ore and coal. The *Tregurtha* is powered by two diesel plants that have a service rated speed 15.5 m.p.h. The self-unloading system aboard is comprised of a 260-foot boom and conveyor system that offloads 10,000 tons of iron ore per hour.

Ocean going vessels from other countries also visit the Great Lakes (Figure 3). These ships are also called third-flag ships or “salties.” Salties enter the Great Lakes system from the Atlantic Ocean via the St. Lawrence River and access many of the same ports as lakers. Their upbound cargo generally includes steel and heavy machinery from Europe and they export grain from U.S. and Canadian ports (LCA). Many overseas shipping firms find that ports in the Great Lakes region are closer than those of the Eastern Seaboard or the Gulf of Mexico. The decreased distance cuts down on costs for these firms (LCA).



Figure 3: A salty escorted by tugs

The primary difference between lakers and salties is their size and hull design. Because they were designed for use only on the Great Lakes, lakers are longer and wider than salties. Most lakers also have a distinct advantage when maneuvering in tight spaces like the Soo Locks. In addition to the propellers at the stern of the boat, lakers use bow thrusters to help turn and slow forward momentum. Most salties rely on tugs to help

with maneuvering. Lakers also have much longer life spans than ocean going vessels because they are not exposed to the corrosive environment of salt water. It is not uncommon to see a laker at sail on the Great Lakes for many decades (LCA).

Survey, Dredge Operations and Strike Removal

The Detroit District of the U.S. Army Corps of Engineers has several survey vessels in its fleet. The crew aboard these boats performs a very important task to support safe navigation depths. During the course of a year, objects can litter the bottom of the navigation channels and harbors on the lakes. These objects can damage the hulls of boats operating in these areas.

The Corps' modern survey vessels are equipped with a SONAR device that will pinpoint the exact location and size of a "strike." The crew can then call for a crane barge or dredge to remove the object. Typically "strikes" are large rocks that have broken off the side of a hard-bottom channel. A few of the more unusual objects found during searches include shopping carts and automobiles. Several shipwrecks have also been located using this survey equipment (Figure 4).

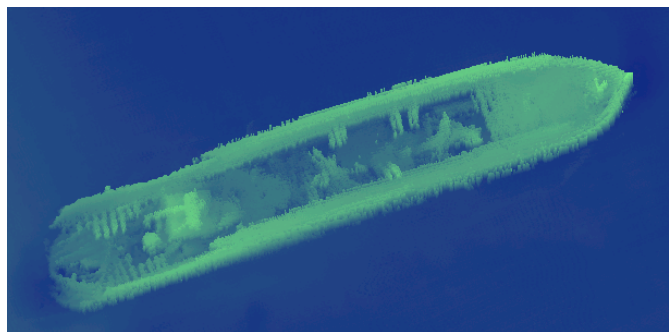


Figure 4: Image of the wreck of the Barnum at the bottom of Lake Huron, as seen using survey equipment

Survey vessels also ensure that the water depth in the connecting channels remains consistent with the authorized depths. For safety purposes, water depth on a navigation chart is shown referenced to low-water datum. Low water datum or chart

datum (CD) is the benchmark on which Great Lakes navigation charts are based. When actual water levels are below CD, the available depth in navigation channels is less than the depth shown on navigation charts. Under these conditions, shippers often must lighten loads.

Weather and Water Levels

Fluctuating water levels and changing weather conditions play a critical role in navigation on the Great Lakes and in the connecting channels. Great Lakes freighters have sophisticated systems on their bridge that monitor water levels and weather conditions in the near real time. This system called NOAAPORT, is made available by the National Oceanographic and Atmospheric Administration (NOAA). With the PORTS system aboard, a captain can view water levels along the journey and at the final destination and make the critical decisions about how much cargo can be safely loaded.

The Edmund Fitzgerald

During the many years of Great Lakes navigation, over 6,000 vessels have been lost. None of these wrecks are more infamous than the *Edmund Fitzgerald*, which went down with all hands, on November 10, 1975 on Lake Superior.

The exact cause of the sinking is still a topic of discussion and several theories exist. One states that the *Fitzgerald* struck bottom near Caribou Island and water filled its ballast tanks, while another claims that the boat's hatch covers were damaged by continuous battering by large waves which allowed the cargo holds to become flooded. After 30 years of speculation the only concrete fact about the sinking is that the weather conditions were among the worst ever seen.

A recent report authored by representatives from the National Oceanographic and Atmospheric Administration (NOAA), examines the weather

conditions on the night of November 10, 1975. The report is entitled “Reexamination of the 9-10 November 1975 ‘Edmund Fitzgerald’ Storm Using Today’s Technology” and is the feature article in *Volume 87, Number 5* of the *Bulletin of the American Meteorological Society*. The corresponding author is Tom Hultquist of the National Weather Service. Portions of the article are paraphrased below and direct lines from the article are noted by quotation marks, with permission from the author.

The study used known meteorological data from the time period around the sinking combined with modern weather prediction models to provide an in depth look at possible wind and wave conditions during the storm. This process is known as hindcasting. It is important to note that “no attempt to further investigate possible causes” of the wreck were examined; the study focused on the weather and wave conditions leading up to the time of the wreck.

“An intense autumn storm moved through the Great Lakes region on 10 November 1975, producing extremely hazardous wind and wave conditions on Lake Superior.”

When the *Fitzgerald* went down, she was only 15 miles from the safety of Whitefish Bay. Another vessel, The *Arthur M. Anderson* of the U.S. Fleet, was following “The Fitz” throughout duration of the storm and its observations provided key meteorological input.

At 7:00 PM EST on 10 November 1975, a surface weather map showed a very deep low-pressure center just south of James Bay. Winds wrapping around a storm at this location would be westerly in orientation near Whitefish Bay and due to the strength of the storm, very intense.

“Conditions on Lake Superior deteriorated rapidly during the afternoon of 10 November 1975, as the *Edmund Fitzgerald* made its

southward journey toward the shelter of Whitefish Bay. By that evening, sustained winds near 50 knots encompassed most of southeast Lake Superior, with more localized winds in excess of 60 knots. These winds generated waves in excess of 7.5 meters (25 feet), which moved from west to east across Lake Superior, nearly perpendicular to the documented track of the *Edmund Fitzgerald*. At around 0015 UTC (7:15 PM EST) 11 November 1975, the *Edmund Fitzgerald* was lost with all hands, coincident in both time and location with the most severe simulated and observed conditions on Lake Superior during the storm. A ship following a similar course to the *Edmund Fitzgerald*, but six hours earlier or later, would have avoided the worst conditions associated with the storm.” The *Arthur M. Anderson* was approximately 6 hours behind the *Fitzgerald*.

Great Lakes/St. Lawrence Seaway Study

The infrastructure of the GLSLS is aging, resulting in greater costs for maintenance to ensure its safety, efficiency, reliability and effectiveness with each passing year. The Great Lakes/St. Lawrence Seaway (GLSLS) Study was initiated in 2003 after an agreement between the U.S. and Canadian governments. Both Canadian and American officials agreed that obtaining a baseline snapshot of existing engineering infrastructure, and current economic and environmental conditions would prove invaluable in determining what actions would be required to ensure no operational degradation in the system for the next 50 years. The study is ongoing the final report is expected in the spring of 2007.

Looking Ahead

The Detroit District of the U.S. Army Corps of Engineers will continue its mission of supporting safe navigation on the Great Lakes. With continued support, navigation on the nation’s “Fourth Seacoast” will continue to prosper.